



# Book Review: Understanding Evolution

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## A book review on

### Understanding Evolution

*Edited by Kostas Kampourakis, Cambridge: Cambridge University Press, 2014*

Understanding evolutionary change has become more complicated in recent years. After a number of theoretical expansions from Darwin's theory of evolution to neo-Darwinism and the Modern Synthesis, evolutionary theory is currently influenced by a fundamental debate about how to expand its theoretical framework even more (Pigliucci and Müller, 2010). This debate is driven by research results on the interplay between developmental and evolutionary processes in fields such as epigenetics, niche construction theory, and especially *evo-devo*, which hold that the dynamic regulatory processes during embryo- and morphogenesis as well as organisms' environmental responsiveness and activity carry explanatory weight in evolutionary theory. It has even been argued that we currently witness the return of not only developmental but Lamarckian ideas into evolutionary biology (Jablonka and Lamb, 2005). These new views have brought about a broad public debate on the question whether "Darwin was wrong" (e.g., Burkeman, 2010)—a debate directly exploited by creationists and advocates of Intelligent Design.

As it thus seems, the time is ripe to investigate the obstacles for public understanding of evolution, as well as the conceptual problems and intuitions hindering people to accept the factual status of evolutionary theory. This is what Kostas Kampourakis' introduction to evolutionary biology, entitled *Understanding Evolution*, aims at. The author is well suited for this undertaking. He has been working on the teaching and public understanding of evolution and genetics, like on children's and students' intuitive explanations of homologies, adaptations, and organismic teleology (e.g., Kampourakis and Zogza, 2008; Kampourakis et al., 2012), for some time now.

The book has six chapters, including, besides the introduction, chapters on "religious resistance to accepting evolution," "conceptual obstacles to understanding evolution," "Charles Darwin and the *Origin of Species*," "common ancestry," and "evolutionary change." First and foremost, these chapters explore the psychological components and intuitions hindering acceptance of evolutionary theory in the public. As Kampourakis puts it: "Evolution is a rather counter-intuitive idea (from a psychological point of view), and it should not be taken for granted that it is easy for all, or even most, people to understand it" (xi). Additionally, *Understanding Evolution* investigates the conceptual boundaries underlying public resistance to evolution.

To a large part this resistance is based on religious worldviews. In particular, Kampourakis discusses creationism and Intelligent Design. Although this analysis shows a bias toward Western (especially U.S.), Christian discourses, it offers an interesting overview of why even today—200 years after William Paley's *Natural Theology*—the idea that biological entities and their structures are designed has not died out. Kampourakis convincingly demonstrates that this is, at least in part, due to strong human intuitions about design that make people conceive of the world as an artifact that demands for some kind of creator. More general, he criticizes that a number of authors, either religious or atheist, mix worldviews with implications of evolutionary theory.

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Other problems for understanding evolution are due to conceptual reasons. This refers especially to the concepts of design teleology and essentialism. Thinking about the world in this conceptual framework makes evolution easily look counterintuitive. Kampourakis argues that in particular the intrinsic purposefulness and evolvable properties of organisms—compared to the extrinsic purposefulness and fixed essences of artifacts—cannot conceptually be grasped by means of the two concepts mentioned above. This sharp-eyed analysis offers the reader not only philosophical but also psychological insight into how, for example, children intuitively think about organisms and artifacts.

Interestingly, Kampourakis puts quite some emphasis on the concept of organism when discussing evolution. He states that organisms require a different kind of explanation compared to artifacts—an explanation offered only by evolutionary theory. At this point, one may argue that, although a number of biologists and philosophers of science have recently announced the “return” of the organism in modern evolutionary biology (e.g., Bateson, 2005), mainstream evolutionary thinking still focuses primarily on the transmission of genes and its effects on populations rather than on the organism. The gene-centered view of evolution even holds that all evolutionary relevant processes are genetic processes that program the development of organisms. These views are still prominent in European classrooms today, for example, when teaching evolutionary change and social phenomena.

Against this backdrop, *Understanding Evolution* offers a new and contemporary perspective on classroom teaching of evolution that includes recent organismic and developmental perspectives. For example, it offers a well readable chapter on *evo-devo*. It starts off with discussing how similarity phenomena ranging from homologies to homoplasies are brought about in evolution. Then, by addressing key concepts of *evo-devo*, such as “heterochrony,” “evolutionary novelty,” “developmental plasticity,” and “robustness,” “constraints,” “genetic accommodation,” and “evolvability,” it offers the reader a balanced introduction to the complexity of the

genotype-phenotype map and describes how large morphological transitions can appear in evolution based on similar gene networks and developmental mechanisms.

One may ask, however, how teachers should deal with the two central conceptual obstacles to understanding evolution identified by Kampourakis—*teleology* and *essentialism*—when educating their pupils and students in this novel developmental perspective on evolution. This question becomes crucial because in this developmental approach organismic teleology is (re)introduced as an *explanans* into evolutionary theory. What is more, in this research domain even essentialist concepts such as “body plan” recently make a comeback (e.g., Lewens, 2009). Unfortunately, the book remains silent about how this crucial challenge of overcoming psychological predispositions and intuitions based on teleology and essentialism can be addressed, for example, when teaching *evo-devo*.

Besides this minor point that can perhaps be overlooked by most readers *Understanding Evolution* is well written and reasoned, scientifically accurate, and very didactic. It situates original and contemporary biological research in historical and philosophical contexts in a balanced, engaging, and accessible manner. Kampourakis has intended the book to be for undergraduate and graduate students in the life sciences, as well as biology teachers. In fact, one can easily anticipate how lively classroom discussion on various conceptual problems or psychological predispositions can emerge from the text—especially with students not convinced by the factual status and/or explanatory role of evolutionary theory. In sum, Kampourakis’ book is a highly important contribution to contemporary education of evolution. Hopefully it will be used as a springboard by various students to approach epistemological, conceptual, and historical dimensions of evolution at the border between knowledge and belief.

## AUTHOR CONTRIBUTIONS

The author confirms being the sole contributor of this work and approved it for publication.

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